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Intelligent Agent Concepts in Information Centers

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ABSTRACT

Human workforce is an important part of community economic development in any economic climate, and certainly even more critical during the financial crises we're experiencing today. This has come to describe a relatively wide range of activities, policies and programs employed by geographers to create, sustain and retain a viable workforce that can support current and future businesses and industry. It is a systematic process for identifying the human resources required to meet organizational goals and developing strategies to meet those requirements. Intelligent agent helps in facilitating the storage and retrieval of information as a result of the activities of the institution which involves a process of managing and maintaining information. Thus, the objectives of this paper are to examine the intelligent agent solution and to identify the effective usage of intelligent agents in information centres, and to describe the four types of intelligent agents adopted by these information centres.

Keywords: *Information centers, digital libraries, intelligent agent, archives, resource center.*

INTRODUCTION

Technologies have been a great medium and reason to rebrand the existing operations, activities, innovations, inventions and interactions in social, economical and global efforts in pursuing the greatest providers to counterpart the demand. The latest innovation for the library operations would be the usage of intelligent agents, where it is a sub-field of artificial intelligence, defined as the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, aims to create an imitation of a human being in performing tasks, to improve the effectiveness of a product or series offered. Information centers are usually user-oriented, thus the birth of intelligent agent solutions to heighten the facilities and user services as to meet the escalating demand for faster and efficient services.

Intelligent agent can be described as a software component designed to perform complex tasks for the user (with or without the presence of the user) and are used in a variety of settings, from instant messaging and web auctions, to ATM network management and air traffic control system. This technology is also adopted in libraries and other information centers, adding a level of user-oriented control and flexibility to activities such as digital collection management and virtual reference. Intelligent agents have been proven to help in facilitating the storage and retrieval of information as a result of the activities of the institution which involves a process of managing and maintaining information beginning at creation and ending at disposition.

DEFINE INTELLIGENT AGENT

Intelligent agent has a prolific and diverse meaning according to the field and the technology that applies such approach. According to Woolridge and Nicholas (2010) intelligent agent as one that is capable of flexible autonomous action in order to meet its design objectives. However, Jafari (2002) has mentioned that an intelligent agent is a set of independent software tools linked to other applications and databases running within one or several computer environments. It shows that the intelligent

agent has become a vital part of technology mechanism in user-services applications and operations, despite its diversity of purposes.

The primary function of an intelligent agent is to help a user to manage and interact with a computer application. Most of the researchers agreed upon having this kind of technology increases the usage of user-oriented technology (Jennings & Woodridge, 1998) that agents are able to carry out activities without constant human intervention.

There are several classes of intelligent agents, each of which refers to its own purposes. Russell (2009) group agents into five classes based on their degree of perceived intelligence and capability: (1) simple reflex agents, (2) model-based reflex agents. (3) goal-based agents, (4) utility-based agents, and (5) learning agents. However, these agents only reveal the mechanical functions on the obedience of orders, more to scientific needs. There are some crucial intelligent agents (Russell, 2009) that can be aligned with the management and administration electronic or digital projects in social sciences particularly in information sciences:

Decision Agents

Decision agents act as a steering commodity that can direct actions undertaken for decision making. Morris (1974) in his study on developing a system to provide the required statistical information for effective management and decision making in university and large public libraries, stated that agent technology focuses on decision-making mechanism can give an impact on creating a model management information system. This model management information system is detailed in terms of characteristics and its structures. It also enable data requirements for library performance measures and program indicators, and benefit-cost criteria for system elements. This intelligent agent contributes to the management of the library as a whole, by providing access and administration control over the given data of instructions. Galen and Pinder (2003) founded that libraries in the UK are investing in self-check technology justify the expense for service or decision maker. It was successfully achieved through the application of the technology. This technology had resulted in a significant positive change in the operation of their libraries. Patel and Suhas (1994) in his previous study on the library, check out/check in

system mentioned that this invention is applicable to library in a library circulation system. This system speeds the performance of check in/check out operations and relieves the librarian to perform other tasks.

Input Agents

Input agents is a mechanism that process and make sense of the sensor input to execute the next step of any repository or databases information system retrieval process. Based on the application of a security gate, the use of electrical signal which represents the codes to a pass/not pass logic circuit is applied. These codes had been used as a communication link between the processor in the terminal and the pass/not pass circuit in the security gate to pass the code from the terminal to the gate (Patel & Suhas, 1994). Goff, Lieffort and Stolberg (2004) stressed on the application for a Radio Frequency Identification System (RFID) highlighted that the input commands or requests applied such antenna shelf tape or shelf tape to facilitate the RFID tags. It was successfully applied when the antenna provides power to the RFID elements in the tags associated with the library materials.

Processing Agents

Processing agents are the term used for the intellectual mechanic to solve a current situation. Taking the example of speech recognition, the processing agents transmit the signals in the form of audios and turn it into bytes, so that the computer-generated system or applications can recognise and proceed to its next move. Patel and Suhas (1994) highlighted some libraries have a patron self check in/checkout systems that are generally operated when to check out a book the patron places his library card in a reader that scans his identification code. The application of barcodes on a library card is to identify the patron by a librarian. This process involves a reader which sends the patron's coded identity to a computer database maintained by the library to determine the status of the patron's account. Goff, Lieffort and Stolberg (2004) stressed on the application for a RFID stated this to be used successfully in libraries. The RFID device will connect to an antenna system. This connects to the RFID tags and optionally magnetic security element. This process identify the library materials from the RFID tags itself.

Temporal Agents

Temporal agents may use time based stored information to offer instructions or data acts of a computer program or human being and takes program inputs precepts to adjust its next behaviours. Goff, Lieffort and Stolberg (2004) stressed that the application for a RFID will involve software which send the commands from the computer to areader. The input technology applied where the reader software has safeguards to verify that the commands sent are valid to the reader.

A simple agent program can be defined mathematically as an agent; which maps every possible percepts sequence to a possible action the agent can perform or to a coefficient, feedback element, function or constant that affects eventual actions. However, this paper only focuses on the four elements of intelligent agents; captured to demonstrate the usage of each in digital and electronic information centers management.

INTELLIGENT AGENT USAGE FOR INFORMATION CENTERS

Intelligent agent's progress have been documented since the early study of the intelligent agent, and the professional literature is largely reflective of project-based exploration and research. Dent (2007) mentioned that the focus has gone from basic implementation of agents for the most basic tasks, to implementation of agent architecture to support information processing in complex environments like large digital libraries. The comprehensiveness of intelligent agent usage has been developed over the years after experimenting with digitised projects that can help system developer and librarians understand better about the use of such agent. Hawkins (2004) suggested that this kind of technology combines artificial intelligence (reasoning, planning, natural language processing, etc) with system development techniques (object-oriented programming, scripting languages, human-machine interface, distributed processing, etc) to produce a new generation of software that can perform tasks based on the user's preferences. All these have been achieved through the evolving project that succeed in developing advanced technology used in speech recognition and also the surrogating personnel.

INTELLIGENT AGENT IN INFORMATION CENTERS

In information centers, like libraries, resource centers and records department, this intelligent agent plays an imperative component among many others; to intensify the usage and retrieval of information via digital, virtual collections using a mechanical technology-aid, usually in a form of software and its applications.

There are some emerging trends in technology that extends its functionality of traditional expert systems to be able to work on distributed information systems, such as digital library, electronic commerce and electronic administration application; and information-oriented organisation such as libraries are bound to adopt this intelligent agent approach (Romi, 2000).

The digital library is a collection of information that is stored and accessed electronically, emerged structures that provide intellectual and physical access to the growing world-wide networks of information encoded in multimedia digital formats (Durfee, Daniel & William, 1997) and also examines research toward the broad goal of personalised harvesting in the information wilderness organised around agency-based architecture. The intelligent agent solution for digital library is not only to reinforce usage of user-oriented mechanisms such as the web- based online public access catalogue (WebOPAC) searching strategies, its also useful in developing a comprehensive storage or repository to ensure easy retrieval via given standards such as MARC21, LCSH, DDC and other classification terms used for standardisation of materials, digital or virtual.

Library system enhanced features and the multimedia nature of digital libraries will require moving beyond simple keyword lookup of information to much more advanced document-processing capabilities in which the system analyzes the content through text analysis, image processing, and speech recognition (Koller, 2003). The digital library can function and operate, mimicking the physical processed done by a live human being, for instance the library user can log onto library digital collection website or repository to access the materials; which is also in a form of digital and goes through the circulation process same as standing in front of the circulation counter in any physical library.

A record can be either a tangible object or digital information: for example, birth certificates, medical x-rays, office documents, databases, application data, and email. Records management is primarily concerned with the evidence of an organisation's activities, and is usually applied according to the value of the records rather than their physical format. In defining the records management of its vital purposes; Xie (2013) stated that records and information management (RIM) is the field of management responsible for the efficient and systematic control of the creation, receipt, maintenance, use, and disposition of records, including processes for capturing and maintaining evidence of and information about business activities and transactions in the form of records. Nowadays the emergence of the need of records to be accessible; and the shift of occupational natures have brought the emergence of the newly electronic record, and often administered in an Electronic Document and Records Management System (EDRM), computer program (or set of programs) used to track and store records. The term is distinguished from imaging and document management systems that specialise in paper capture and document management respectively. EDRM systems commonly provide specialised security and auditing functionality tailored to the needs of records managers. Intelligent agent solutions can be found in several cases of the project.

The explosive growth of information technology demands for a new method to manage records and information as information consists of a variety of forms that need to be controlled and managed beyond the traditional paper based records. Owing to this fact, the management of records has increasingly played an important role in both the public and private sectors whether in a large or small organisation. Records may be considered as essential strategies, resources for any organisation which is necessary to demonstrate good governance and accountability (Azmi, Irwan & Ruzaif, 2004). Therefore, these strategic resources need to be captured in the organisation's memory to support its smooth running by ensuring all the records are available when needed.

Meanwhile, electronic records management is an essential aspect in monitoring information assets in many organisations. It is concerned with the capability of the organisation in managing, storing and preserving electronic records that are required to support policy and top management's

decision making, delivery of services and the information needs of the business to meet accountability. Practicing good and successful electronic record management is significant for many organisations and good quality records are needed to make the right decisions and take possible measures in order to achieve the mission of the organisation. Owing to the advancement of technology, the world of record keeping is evolving and this phenomenon has forced many archives and records center to adopt various intelligent agents such as Electronic Records Management System as a tool to manage electronic records. This processing agent assists users in accelerating the process of managing and maintaining electronic records beginning at creation and ending at disposition.

Until recent years, improvements in the practices of records management were still evolving, especially in the management of records in an electronic environment. While the problem persists, various intelligent agents were introduced as to assist organisation to manage both paper and electronic records.

PRACTICAL APPLICATION CASES

The applications of intelligent agent technology are well documented in the literature from computer science or engineering perspective, but not from library perspective. A variety of papers and books from the year 1988 to 2006 written on agent technology and its applications in a web based environment. According to Dent (2007) the use of artificial intelligence in areas relevant to information settings, applicable in library settings are as follows:

Managing the Hybrid Library for the benefit of Users (MALIBU)

MALIBU projects aim to provide access to both print and electronic resources within a union framework. A multi-agent architecture is put into practice in the search engine prototype. It allows users to search for and retrieve a variety of digital and non-digital, internal and external resources using a single interface. The architecture supports distributed development agent interaction and system maintenance (Dent, 2007).

Distributed Agents for User-Friendly Access of Digital Libraries (DAFFODIL)

DAFFODIL is a search interface project for digital library, aiming to provide strategic support for users to search and retrieve information in digital libraries. DAFFODIL novelty is its ability to offer user support for both low and high-level information seeking (Bates, 1999). The relevancy of DAFFODIL tools includes a personal library and interactive tools such as "did you mean..." features that checks the search terms in a query and makes suggestions or corrections.

Lots of Copies Keeps Stuff Safe (LOCKSS) Projects

LOCKSS is an initiative in e-journal archiving that contribute to an open source platform, where the libraries are allowed to build their own digital collections and provides librarians with a way to collect, store, preserve, and provide access to their own, local copy of authorised content. The LOCKSS system converts a computer into a digital preservation "appliance" in the library that, with a publisher's permission non-invasively collects specific content to which the library has access.

This agent technology is also widely used in Malaysia. For example, Police Report System of Bukit Aman Royal Malaysian Police and Development of Online Finding Aids system for the users of National Archives of Malaysia.

Police Report System (PRS) is a decision agent to facilitate management of records created made by complainants. This agent also makes possible searching and retrieving the records needed in a quick and simple manner. Accountability for the integrity of highly structured PRS and for the integrity of the data generated in this system is always obvious and clearer than it is for the environment where work practices are poorly defined and may not be as clear.

National Archives of Malaysia is in the process of developing Online Finding Aids (OFA) as an intelligent agent. This agent is divided into six main modules, namely, finding aids module development, data integration between OFA and data generated by the Computerized Archival System

(COMPASS) application, Archival Management System (AMS) and Media Asset Management System (MAMS), online archival material reservation module, online payment module, digital preservation module and COMPASS and MAMS modification module.

The main objective in the development of OFA is to provide a user friendly system with interactive interface. This directly allows the users or researchers to search archival materials easily. Thus, they can make a reservation and payment to purchase required digital archival materials. Furthermore, OFA allows centralised search to be done easily in order to find different types of archives. This is due to the capability of OFA system to do a centralised search between COMPASS, AMS and MAMS applications which are used to store archival materials according to the different types and formats. OFA system also allows simultaneous access to the same archival material without limit the number of researchers at the same time. This system enables both researchers within and outside the country to access NAM's archival materials without limitation of time and place.

DISCUSSION AND CONCLUSION

Luo, Ke and Jing (2013) suggested the core characteristics of the information professional is to act as a guide in the face of uncertainty, to collaborate, prioritise and maintain flexibility in the face of changing goals, empower users and understand one's organisation and colleagues. The use of agent technology in libraries does, however present certain challenges, as there are both technical and social implications that are not easily addressed. Researchers and developers advance that libraries are a perfect match for implementing agents in any number of scenarios, but librarians involved with reference, systems, technical services and instruction must be able to first define their work, and then conceptualise appropriate uses of agent technology that will benefit the end user.

Development and implementation is another matter to be considered. Library computing environments must be able to support agents, allow for ease of deployment, manipulation, and modification. Librarians must also understand fundamentally how agents work, and provide some background

information about their function to the user. Razia (2013) in her study said that "rapid prototyping techniques" be used to support ongoing development and evaluation of agent applications. Using intelligent agents requires practitioners to monitor their performance, always with an eye towards improvement. In the case of a digital library, collections would need to be substantial enough to make implementation of agent technology worthwhile. Meaningful uses of intelligent agents for routine tasks would ideally free up library staff to pursue more meaningful work, and also, add to the library's technical profile. More involved use of agents requires careful consideration of the challenges and benefits to the user.

Records and archives management requires a holistic aspect of management. It requires people, resources, record resources as well as system resources to be integrated. There are various methods for managing records and each organisation has its own ways based on its requirements. Future research could be conducted to seek more thorough explanation of the involvement of intelligent agents in the management of information from various organisations and fields either public or private. This kind of study could establish the foundation for the basic diversity of intelligent agents' usage as different organisations have different types of activities and operations.

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